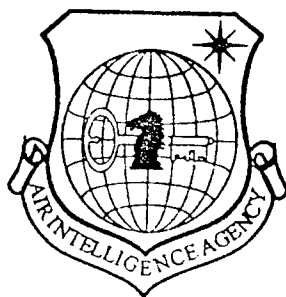


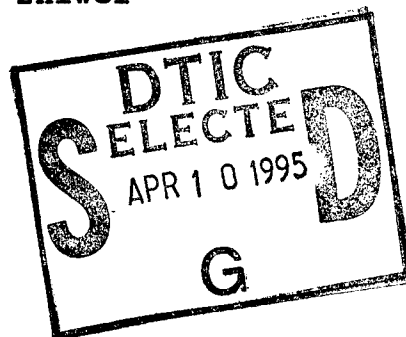
# NATIONAL AIR INTELLIGENCE CENTER



## A REAL TIME METHOD FOR FOURIER TRANSFORM HOLOGRAPHIC INFORMATION STORAGE

by

Cai Tiequan, Wan Hui, Tian Zhiwei



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PREPARED BY:

TRANSLATION SERVICES  
NATIONAL AIR INTELLIGENCE CENTER  
WPAFB, OHIO

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Cai Tiequan, Wan Hui<sup>1</sup>, Tian Zhiwei<sup>2</sup>

An experiment was designed as it was shown in fig.1. S is white light source and is recorded as  $O(x_0, y_0)$ . LCLV is a light crystal light valve in mixed field effect. Lens  $L_1$  forms image  $I(x, y)$  on CdS membrane of a light conducting layer of light valve. When voltage on liquid crystal layer  $>$  threshold of liquid crystal, a voltage image can be formed on CdS and liquid crystal which corresponds to input light image. Laser LA is subdivided into two beams on  $BS_1$ . One beam is used as reference light, the other beam is scattered by K and is condensed by  $L_2$ , and then is refracted by  $P_1$ . Subsequently it is reflected by  $BS_2$  and forms parallel beams. They are then reflected by LCLV and controlled by voltage on the liquid crystal. They form incoherent light images which correspond to the input light image  $O'(x', y')^{[1,2]}$  after they are corrected by  $P_2$ .  $O'(x', y')$  is object image in Fourier transformation light path. By adjusting the voltage and frequency on LCLV, a linear relation between  $O'(x', y')$  and  $O(x, y)$  can be obtained:  $O'(x', y') = \alpha O(x, y)$ .  $L_3$  is Fourier transformation lens, P is spectrum surface, the spectrum profile is

$$F\{O'(x', y')\} = F\{\alpha O(x, y)\} = \alpha F\{O(x, y)\}$$

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\* Numbers in margins indicate foreign pagination.  
Commas in numbers indicate decimals.

<sup>1</sup> Physics Dept., Zhejiang Normal Univ., Jinhua.

<sup>2</sup> Physics Dept., Hangzhou Univ., Hanzhou.



In comparison to ordinary storage, the following are advantages of the results of omission of conversion of data to negative images: saving film; simplifying experimental procedures; real time; convenience in storing both negative and positive images. For data that needs positive image storage (i.e. painting), in ordinary storage method, two shootings have to be done in preliminary processing or reverse developing has to be used in order to obtain a positive image. With our method, we can directly get positive image output  $O'(x',y')=aO(x,y)$ . Even in some special applications in which storage of negative image information is needed, our method is still valid. This is because of the presence of sharp light peaks on electric-optical curve of liquid crystals. When working points are in regions where light intensity is strictly monotonic on the voltage, light valve will have output images with reverse contrast. Thus, by merely changing the voltage  $U$ , a reverse output of  $O(x,y)$ ,  $O''(x'', y'')$ , and  $O'''(x''', y''') = BO(x, y)$  can be obtained ( $U=9.8V$  when all the other variables are kept constant). Of course, by changing polarizer  $P_1$  (fig.1) or the position of light axis of the reverse polarizer, a reverse output of object  $O(x,y)$  can be obtained. This is easier to handle and precisely what we did in our experiment. Fig.2(c) is a reconstructed image of the negative image hologram.

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